

Lessons from the “PI-in-a-Box” project (SLS-1 and SLS-2)

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Outline”

- Purpose of “PI-in-a-Box”
- A brief history
- Challenges
- Solutions
- Lessons learned

Purpose of “PI-in-a-Box”

- (Official): The goal of the PI-in-a-Box project is (was)to improve the scientific return of experiments performed in space by providing astronaut experimenters with an "intelligent assistant" that encapsulates much of the domain-and-experiment-related knowledge commanded by the PI on the ground.
- (Unofficial): To show that NASA’s investment in AI technologies was worthwhile.

Lessons

1. Projects usually have more than one goal
2. Some goals are stated, some are not
3. Sometimes these goals are compatible

QuickTime™ and a
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are needed to see this picture.

PI-in-a-Box on Neurolab

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A brief history

- (~1986) Meeting between MIT professor Laurence Young and our AI branch
- (~1987) Telecons start and I write the first lines of code (Nexpert shell) for rapid prototype
- (~1988) Development team in place (about 10 people MIT/Stanford/Ames) - Software approach changed
- (6/91) Ground support of Rotating Dome experiment on SLS-1
- (10/93) In flight use with Rotating Dome experiment on SLS-2 (first “Expert System” in space) - My involvement stopped here
- (4/98) Applied to sleep experiments on “Neurolab” mission

Challenges

- Multi-institution project
- Technical (both s/w and h/w)
 - Guess at h/w development
 - Manage expectations inflated by hype...
 - Dealing with flight qualification issues
 - Interfaces with other flight systems
- Slipping flight schedule
- Getting the astronauts to “buy in”
- Giving the astronauts adequate training

Solutions

- Multi-institutions:Weekly telecons and meeting twice yearly
- H/W: need a “guru” who really understands what can happen
- S/W: same as above, but multiplied by the nr. of software systems we had to integrate (3). Allow for time slippage. Downselect features.
- Establish good relationship with flight qualification people
- Adapt to special needs of astronauts

Lessons

4. Better simple and working than complex and flaky...
Separate your dream from the reality...
5. Must understand and work with different institutional cultures (in our case) Ames, MIT, JSC, Astronauts
6. There is no substitute for competence and determination in your own team
7. Astronauts are very SPECIAL users (time cost, visibility, pride, desire to do good science...).
8. You will feel like it's NEVER going to come together!
9. Flight schedule slippage can be both a curse and a blessing

Final lessons

- 10. Who said politicians invented “spin”?
- 11. Make sure that all stake holders can claim success..
- 12. A good name can be important (ASA or [PI]?)
- 13. Accept undeserved praise... it sure beats undeserved (or deserved) blame!